

The drought made the fire hazards greater than usual and at times gave cause for much anxiety. The Arboretum proper escaped with one or two minor fires that were put out without any serious damage. On the land adjoining the branch line of the New York, New Haven and Hartford Railway a fire caused either by sparks or live ashes established itself in the peat bog and burned intermittently for more than two months. The railway company behaved very well, paying two hundred and fifty dollars damages. The Park Commission continue to keep the roads in good condition and carry out their part of the contract with Harvard University in an admirable manner. The police protection, however, remains most inadequate, indeed, it may be truthfully said that the Arboretum is unprotected.

During the year 3,222 plants, including grafts and cuttings, were distributed in the United States, Canada, Great Britain, Holland, Germany, Poland and Hawaii and 1,627 packets of seed in the United States, Canada, Great Britain, Ireland, Finland, United Soviet Socialistic Republics, China and New Zealand. There have been received 22,912 plants, including grafts and cuttings and about 15,000 bulbs, from the United States, Canada, Great Britain, Cuba and Japan and 754 packets of seed from the United States, Canada, Cuba, Navassa, Great Britain, Ireland, France, Germany, Poland, United Soviet Socialistic Republics, China, Japan, India, Australia, and New Zealand.

The "Bulletin of Popular Information" was issued as usual and its circulation has enlarged. The regular four numbers of the "Journal of the Arnold Arboretum" were issued; the circulation has increased and it continues to be a valued medium of exchange.

Visitors to the Arboretum were more numerous than in any previous year. Some 1,114 visitors registered at the Administration Building; they came from nearly every state in the union and from several countries of Europe, from South Africa, New Zealand, China, Japan and Java. Among the most distinguished visitors was General J. Smuts, an ardent botanist and one time Prime Minister of South Africa. Another was Mr. Arthur Osborn, who has charge of the arboretum at the Royal Botanic Gardens, Kew, England. Mr. Osborn spent a couple of weeks in the Arboretum and made a list of four hundred plants in cultivation in this Arboretum not growing in Kew Gardens. In July The American Association of Nurserymen held their convention in Boston and some five hundred of them spent a day among the Arboretum collections. Letters seeking information on dendrological and horticultural subjects increased and so, too, did the number of plant specimens sent in for identification. That the Arboretum is doing useful work, is best emphasized by the fact that the response to its annual appeal was more generous than ever before and included several hundred new supporters.—E. H. W.

Pathological Laboratory.—The second year in the history of the Arboretum's research laboratory in Plant Pathology has been marked

by an enlargement of equipment, a growing list of inquiries for help, and an active program of investigation.

Early in the year an experimental greenhouse was erected contiguous to the laboratory. This supplied an imperative need; it has been occupied almost to capacity from the outset with experimental work for which provision elsewhere would have been impossible. A second item of interest has been the inauguration of a pathological herbarium. The private collection of the staff afforded a nucleus as a beginning. To this have been added many hundreds of specimens obtained from the western United States, collected during the summer of 1929 by Mr. G. D. Darker, who was sent out by the Arboretum for that purpose. The object in view is the accumulation of a working and reference collection, as complete as possible, of preserved materials illustrating the many diseases of trees and shrubs. Provision for the care and the housing of such a collection remains to be made.

Inquiries for advice relative to specific diseases of trees, shrubs and forests have been received from about twenty States and Provinces. They have come from nurseries, forest operators, institutions and private owners.

The investigational activities have been varied, and substantial progress has been made on several problems undertaken. A summary follows.

1. A RECONNAISSANCE OF THE FOREST DISEASES OF NOVA SCOTIA. In July, 1929, Nova Scotia was visited at the request of the Provincial Forester, to examine cross sections of its forests from a pathological point of view (J. H. FAULL. Notes on Forest Diseases in Nova Scotia. Jour. Arnold Arb. XI. 55-58. 1930). One immediate outcome has been the starting of an investigation of a disease which has ravished the Beeches there—a disease knowledge of which is of commanding interest because of the imminent threat to this highly valued tree species beyond the limits of that Province.

2. PHACIDIUM BLIGHT OF CONIFERS. The Report of the Arboretum for 1928-29 made reference to the success that had attended our efforts in a study of the cause of this disease and its control in nurseries. Observation and experimentation continued in the nursery of the Brown Company at Oquossoc, Maine, have shown that many species of Conifers other than Spruces are susceptible to Phacidium blight, that the disease is perfectly controllable in all of them, and that without control their culture in areas characterized by certain climatic features is liable to failure. Similar studies have been extended to Phacidium blight in plantations (J. H. FAULL. The Spread and the Control of Phacidium Blight in Spruce Plantations. Jour. Arnold Arb. XI. 136-147. 1930).

3. TRUNK AND ROOT DISEASES OF SPRUCE. A good deal of attention has been devoted during the year to a complex of problems comprised under this designation, and at present they constitute one of our major undertakings.

4. **ELM DISEASES.** We have been fortunate to have had with us throughout 1929-30 Dr. C. J. Buisman of the Phytopathologisch Laboratorium "Willie Commelin Scholten," Baarn, Holland. Miss Buisman, who had already made notable researches on the European Elm disease, occupied herself with studies on the diseases of our native Elms, with special attention to those of the American Elm. Towards the end of her sojourn here a finding of great potential importance was made in some diseased Elm specimens sent from Ohio, namely, the presence of an organism that appears to be identical with the causal agent of the feared European Elm disease. As a result the Federal Bureau of Plant Industry was enabled to reach decisions of moment in this connection.

5. **NEEDLE CAST FUNGI.** Studies on this group of fungi have been materially advanced by Mr. G. D. Darker.

6. **LILAC DISEASES.** Most important among the diseases of Lilacs is one which is shown to follow a prevalent, but ill-advised practice among propagators. Studies nearing completion, made by Mr. K. S. Chester, have demonstrated the cause and point the way to avoidance of the same. A preliminary account appears in the present issue of this Journal.

7. Various minor topics have been taken up. Mention may be made of one, namely, on a rot of Calla Lily, since the brief paper published on it constitutes one of the the first records of this destructive, imported disease in America, and at the same time has something constructive to offer with respect to its control (K. S. CHESTER. The Phytophthora Disease of the Calla in America. Jour. Arnold Arb. XI. 169-171. 1930).—J. H. F.

Cytological Laboratory.—The investigation of the chromosome numbers of the species of the more important genera has been continued and several lines of work have been completed. The results obtained throw some light on relationships of different species and in some cases are of considerable interest to the plant breeder.

All of the pure species of *Syringa* were found to have the same chromosome number, but crosses can be made only between species in the same taxonomic groups. The chromosome relationships in certain hybrids indicate that all of the existing species are tetraploids. These results have been published in the Journal of the Arnold Arboretum Vol. XI, 1930.

The chromosome relationships in the genus *Rhodendron* have been found to be most interesting. This polymorphic genus contains nearly 500 species, but representative species of different sections of the genus have the same chromosome numbers or are tetraploids. Hybrids between American and Oriental species show that there is complete compatibility between the parental chromosomes, although the two species may have been separated for millions of years. An account of this work has been published in the American Journal of Botany, Vol. xvii, 1930.

Chromosome counts in *Vitis* show that the species of the subgenus

Euvitis have 19 pairs of chromosomes, while the *Muscadinia* species has 20 pairs of chromosomes. This difference in chromosome number seems to be associated with fundamental differences in the two subgenera so that no fertile hybrids can be obtained between these two groups. This work has been published in the Proceedings of the American Society for Horticultural Science, 1930.

A cytological study of the *Caprifoliaceae* shows that in most genera the basic chromosome number is the same. There is, however, a great deal of difference in the size of chromosomes of the different genera. No correlation was found between chromosome number or size and the degree of specialization of wood structure. These results were published in the Journal of the Arnold Arboretum Vol. XI, 1930.

The chromosome number and behavior in hybrids between different genera of the Pomoideae of the family Rosaceae have been studied. The fact that the chromosomes of different genera of this group may function together indicates that they are more closely related than the taxonomic classification would imply. Part of this study has been published in the Proceedings of the National Academy of Sciences Vol. 15, 1929. A more complete cytological analysis of the Pomoideae will appear in the next issue of this Journal.

A study of chromosome structure and the nature of chromosome association at the meiotic divisions is of considerable value in the determination of the cause of variations in chromosome numbers in various genera and in species hybrids. A study of chromosome structure in *Secale* and *Lilium* has shown the nature of chromosome association at meiosis and has served as a basis for a cytological interpretation of crossing over. This work appears in the present issue of this Journal.

An investigation of chromosome structure is also being carried on with material which was collected at the Harvard Biological Laboratory, Soledad, Cuba.

Breeding work has been continued, especially with the more important horticultural genera. Seedlings from the crosses made last year are now growing in the new greenhouse.—K. S.

The Herbarium.—The Herbarium now contains 333369 sheets, 18313 having been added during the time from July 1, 1929 to June 30, 1930. Of these accessions approximately 5700 were native of the United States and Canada, 2700 of Central and South America including Mexico and the West Indies, 1615 of Europe and Western and Central Asia, 4800 of China, 1000 of Southern Asia and Malaysia, 400 of Africa, 600 of Australasia and 1000 were cultivated plants. Among the more important collections received during the year the following may be mentioned: from expeditions wholly or partly supported by the Arnold Arboretum were received about 2000 numbers with numerous duplicates collected mostly in the southern and southwestern States by E. J. Palmer, about 850 numbers with many duplicates collected by J. G. Jack in Cuba, about

1000 numbers with many duplicates collected by S. F. Kajewski in the New Hebrides and Santa Cruz Islands, more than 3500 numbers with duplicates collected by W. P. Fang in the Chinese province of Szechuan, nearly 600 numbers with duplicates collected by C. T. White and S. F. Kajewski in North Queensland, about 250 numbers with duplicates collected by J. Mattfeld in Bulgaria. As gifts were received about 360 numbers with duplicates collected by W. Bangham in Central America and the West Indies, and about the same number collected by F. M. Salvoza in Panama and Cuba, about 120 numbers with duplicates collected by Dr. J. Becquaert in Yucatan, and about 540 specimens of cultivated plants from Vilmorin-Andrieux in Paris. By exchange were received from the Sun Yatsen University about 1700 Kwangtung plants, from the Edinburgh Botanic Garden about 500 Yunnan plants collected by G. Forrest, from the Metropolitan Museum at Nanking about 360 plants from Kwangsi collected by R. C. Ching, from the Riks Museum at Stockholm about 330 plants of Tropical America, from the Berlin Botanic Garden about 200 Kamerun plants, from the Yale Forestry School about 350 Liberian plants collected by G. P. Cooper; from the New York Botanic Garden about 1250 plants from E. Asia and the Philippines. Through purchase were acquired about 300 specimens from Argentina collected by Venturi and about 300 specimens from Mexico collected by C. A. Purpus.

Besides the constant use of the herbarium by the staff in the determinations of plants sent in for identification and in the determination of large collections, chiefly from North America and Eastern Asia, the facilities of the herbarium have been used by students of other departments of the University and from abroad as by Mr. Chien P'ei of Chengtu, China, who is working on a revision of the Chinese Verbenaceae and by Mr. F. P. Metcalf of the Canton Christian College who is preparing a flora of Fukien. For study outside of the Arboretum 803 specimens have been sent out on loan to 18 institutions and individuals in this country and Europe.

There have been distributed from the herbarium 17430 specimens to 41 institutions in the United States and Canada and in Europe, Australia and Africa; also 350 wood specimens to two institutions.

To the fruit collection 137 specimens have been added which brings the number of fruit specimens up to 7037. The fluid in which fleshy fruits are preserved has been changed from a formalin solution to an alcohol-formalin solution.

The arrangement and labeling of the wood collection has been finished and the general wood collection now contains 2186 specimens arranged in systematic order, 686 having been added during the year.

Botanical explorations partly or wholly financed by this institution have been carried on in different parts of the world. Dr. H. Humbert who has collected during the second half of 1928 in Madagascar, has spent